**Unit Overview: SBI3U - Internal Systems and Regulation**

**Overall Goals**: Students will learn about the structure and function of all the components involve in the circulatory, repiratory and digestive systems. They will understand how the purpose of each of the systems and how they work together in the body. Students will be able to make connections to other organ systems in the body and be able to apply their knowledge in order to solve a variety of problems surrounding these three organ systems.

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| **Lesson** | **Concepts** | **Learning Expectations** | **Teaching and Learning Strategies** | **Assessment and Evaluation** |
| 1 | Introduction: The importance of ingestion and digestion | E.2.1, E.3.2 | Labelled diagrams of different digestive systems (humans vs birds vs ruminants)  Ruminants: <http://www.mun.ca/biology/scarr/Ruminant_Digestion.htm>  Birds:  <http://people.eku.edu/ritchisong/birddigestion.html> | - Venn diagram comparing different digestive systems |
| 2 | The role of teeth, salivary glands, esophagus and stomach | E.2.1, E.3.2, E.3.4 | -short PowerPoint presentation of diagrams  -case study  <http://www.mhhe.com/biosci/ap/seeleyap/>  student/olc2/chap17studies.htm  -this is a case study on peptic ulcers and the conditions in which they can occur. Students will read the case study, discuss it in small groups and then answer a corresponding set of questions (describe the components of gastric juice [K], in the absence of infection why doesn’t gastric juices damage the stomach wall? [MC]) | -worksheet  -Case study questions will be handed in for assessment |
| 3 | The role of the pancreas, liver and gallbladder | E.2.1, E.3.2, E.3.4 | -animations  <http://highered.mcgraw-hill.com/sites/0072495855/>  student\_view0/chapter26/animation\_\_organs\_of\_digestion.html  -explains each step of the digestive system, including the role of the pancreas, liver and gallbladder  - Jigsaw  -the role on the pancreas in digestion  - the role on the liver in digestion  -the role on the gallbladder in digestion | -collect student’s notes taken during Jigsaw |
| 4 | The role of the large and small intestine | E.2.1, E.3.2, E.3.4 | -video  <http://www.youtube.com/watch?v>=  Z7xKYNz9AS0&feature=related  - reviews the digestive system but focuses on the intestines and illustrates the villi and its components.  -class discussion  -As a class students will discuss possible lifestyle choices that could affect who effectively digestion and reabsorption of nutrients occurs in the intestines.  -Questions:  -Explain how taking a laxative will decrease nutrient and water absorption.  -Is it easier or harder for the body to digest diets high in fat?  -Some people have to have part of their intestines surgically removed for medical reasons. What affect will this have on their ability to digest foods? What lifestyle changes might they have to make? | -assess summary chart of all the digestive system structures and their functions  -are students able to make connections between decreased transit time and poor digestion?  -are students able to apply their knowledge to make reasonable predictions about what may occur in a new scenario? |
| 5 | Mini Labs: What happens when you eat | E.2.1, E.3.2 | -in groups of 3 students will travel to 3 different stations where they will do an activity about a component of the digestive system and answer related questions. Ability groupings can be made so that the teacher can provide a lot of guidance to the group of lower ability students.  **Station 1:** **Carbohydrate Digestion**  Students chew unsalted soda crackers for two minutes. After two minutes the crackers should taste sweet since the complex carbs are being broken down into simple sugars by the amylase in their saliva.  **Station 2: The Role of Villi**  Students observe the difference in the amount of water that one paper towel can soak up versus two, three or four paper towels. This helps to demonstrate the more folds in the intestine (villi) the more nutrients and water can be absorbed.  **Station 3: Protein digestion**  In this lab a ball of hamburger meat is placed in a Ziploc bag along with A small amount of HCl and two digestive juices, one consisting of pepsin, trypsin and water and the other consisting of bile salts, pancreatin enzyme and water. The students simulate the stomach by mashing the bag until the meat is “digested”.  Lab taken from <http://mypages.iit.edu/~smile/bi9706.html> | -Observation  -Lab report  - achievement categories being focused on for this lab will be Knowledge and Understanding as well as Communication.  -students will be asked to communicate their findings using diagrams and flow charts. |
| 6 | Food energy and essential nutrients | E.1.2, E.3.4 | - small group mind map  - 5 minute informal presentation on nutrients | - collect mind maps  -checklist for presentation |
| 7 | Introduction: Open and Closed circulatory system and Components of Blood | E2.1, E3.3 | -Students to begin by being involved in a T/P/S discussing (i) various functions of the circulatory system (ii) Two types of circulatory systems  -The concept of Open and Closed Circulatory systems will be introduced to students. Students will view a power point presentation comparing/contrasting the two types of systems.  -Students will be introduced to the components of blood using the following video: <http://www.youtube.com/watch?v=bzYmPQOKBL8>  Students will then complete a T-chart comparing/contrasting the various components of blood (appearance, origin and function)  -Students will complete a Quick Lab activity examining blood and its composition | -T-chart to be assessed (K/C)  -Lab worksheet (K/C) |
| 8 | Blood vessels, nutrient exchange and the lymphatic system | E2.1, E3.3 | -Start lesson by completing a Case Study on Blood Doping  -Introduce various blood vessels (video) <http://www.youtube.com/watch?v=CjNKbL_-cwA&feature=related> followed by (video)  <http://www.youtube.com/watch?v=Q530H1WxtOw>  -Students to create a T-chart comparing/Contrasting the 3 types of blood vessels  -Students to complete the Check and Reflect Questions pp. 309 (Sandner, Lionel, Clayton Ellis et al. *Investigating Science BiologySource 11*. 2011 ed. Toronto: Pearson Education Canada, 2011. Print.) | -Rubric (T/A)  -Assess questions (K)  -T-chart to be assessed (K/C) |
| 9 | Anatomy of the heart and circuits of blood flow | E2.1, E2.2, E3.3 | - students will be required to read pages 311-313 in the student text(Sandner, Lionel, Clayton Ellis et al. *Investigating Science BiologySource 11*. 2011 ed. Toronto: Pearson Education Canada, 2011. Print.)  -Students to label diagram of human heart  -In order to consolidate student’s understanding of the text, students would then be introduced to the following gizmo:  <http://wwwexplorelearning.com/index.cfm?method=cResource.d>  spView&ResourceID=662  -While exploring the gizmo above, students would complete the Student Exploration: Circulatory Systems Handout:  <http://cs.explorelearning.com/materials/Circulatory_System_SE.pdf>.  -Upon completion of the above activity, students to reflect on the following: Why is the mammalian heart sometimes referred to as a “double-pump”?  -How is the circulatory system linked to other organ systems? Construct a mind map.(Thereafter, students to share and discuss) | -Mark labelled diagrams (K)  -Worksheet and mind map to be graded (K/C)  -Mind map (T) |
| 10 | Regulation of heart beat and blood pressure | E2.1, E2.3 | **-**Students to read pp. 313-316  -Students to complete Quick Lab D9 pp. 316 (Sandner, Lionel, Clayton Ellis et al. *Investigating Science BiologySource 11*. 2011 ed. Toronto: Pearson Education Canada, 2011. Print.)  -Students to complete Check and Reflect pp. 317 | -Lab Report (K/C/T/A) |
| 11 | Mini Lab: Track the clogging of an artery & Promoting a healthy circulatory system | E1.2, E2.1, E3.4 | -**-**Students toRead pp. 318-320 and work on quick Lab D10: Tracking the Clogging of an Artery and complete hand-out (Sandner, Lionel, Clayton Ellis et al. *Investigating Science BiologySource 11*. 2011 ed. Toronto: Pearson Education Canada, 2011. Print.)  - In pairs choose one Cardiovascular disorder (the disorder need not be one of those mentioned in the text) and prepare a presentation for the class. | -Mark lab handout (K/C)  -Rubric to assess research and presentation (K/C/T/A)  -Anecdotal notes and checklist |
| 12 | Decision-Making Analysis: Top Canadian Technological Innovations | E1.1, E2.1 | -**-**Analysis D11(Sandner, Lionel, Clayton Ellis et al. *Investigating Science BiologySource 11*. 2011 ed. Toronto: Pearson Education Canada, 2011. Print.)  -Students to survey Canadian Technological developments that meet societal needs and are related to the circulatory system.  -students to complete independent research paper | -Grade research paper  -Rubric (C/T/A) |
| 13 | Review |  | -Students continue research from last class  -Chapter Review-mini quiz | -Grade research paper  -Rubric (C/T/A)  -Grade Quiz (K/C/T/A) |
| 14 | Introduction: The Process of Respiration | E3, 2.1 | -Have students complete a KWL chart for the respiratory system (perhaps list some key words on the board for them to discuss in their chart – e.g. Lungs, trachea, emphysema, inspiration, expiration, etc.).  -Introduce the students to the respiratory system – the process of respiration and basic terminology.  -Have students work in groups to answer a few questions and then take it up as a class. Sample questions:  -What four processes are involved in respiration?  -What is the difference between breathing and cellular respiration? | - KWL chart to be read by teacher – diagnostic assessment (C, K)  -Interactive class discussion will assess students on their communication skills and on their knowledge/understanding of the concepts that were presented to them in this lesson. (K/U, C) |
| 15 | Human Respiratory Anatomy | E3, 2.1, 3.1 | -Provide students with a diagram of the respiratory system that has blanks. Students are to work in groups to fill in the blanks on the diagram. An example of a diagram that could be used can be found at the following website: <http://www.proprofs.com/quiz-school/upload/60284.gif>.  -Then, have students work individually to create T-charts. The T-charts will include explanations that each of the following body parts plays in respiration: mouth and nasal cavity, pharynx, epiglottis, trachea and larynx, bronchi (bronchial tubes), bronchioles, and alveoli.  -Have a brief discussion with the students touching upon all body parts involved in respiration | Anecdotal notes of collaborative work –  • learning skill: *collaboration*   * Assess groups’ diagram *(K/U)* * Assess T-charts *(C, K/U)*   • learning skill: *independent work* |
| 16 | The Mechanism of breathing: Inhalation and Exhalation | E 3.1 | -Review prior knowledge from lessons 14 and 15 using the videos listed at the bottom (approx. 22 min. total). Provide students with a short worksheet to complete as the videos play.  -Have students work in pairs to create a venn diagram of inspiration and expiration. Students should examine the following in their venn diagrams: diaphragm movement, intercostal muscles/rib cage movement, air pressure inside chest cavity.  -Take up pair work | -Completion mark: video worksheet  -Circulate around classroom – take note of student work and comprehension  -Assess venn diagram (K/U, C)  • learning skills: *collaboration, organization* |
| 17 | Gas Exchange and Transport | E 3.1 | -Present the following topics to students: Dalton’s law of partial pressures, oxygen transport, carbon dioxide transport  -Have students work in groups to create mind maps on ‘Gas Exchange and Transport’. Mind maps are to be completed on chart paper. Then, tape mind maps on the walls around the classroom and have students do a gallery walk observing other groups’ work.  Have students complete textbook questions | -Anecdotal notes of collaborative work  -Mind maps to be assessed for grading (C, K/U)  • learning skills: *collaboration, organization*  -Textbook questions – problem solving (T/I) |
| 18 | Disorders of the Respiratory System: Bronchitis, Emphysema, Lung Cancer | E3, 1.2, 3.4 | -Divide students up into groups to research one disorder of the respiratory system. Examples include emphysema, lung cancer, and bronchitis. Students are to come up with an interesting way to present their findings to their classmates – e.g. power point presentation, skit, etc. | -Assess presentation and research presented – was the research accurate? Did students provide resources? Was the presentation creative? (T/I, A, C)  • learning skills: *collaboration, initiative, organization* |
| 19 | Lab: Fetal Pig Dissection | E2, 2.2 | -Students are to dissect a pig – they can choose to do so in a lab setting or they can complete a virtual dissection – link available at bottom  -Follow the lab in *Nelson 11: Biology* entitled “Examining the Systems of a Fetal Pig” on pages 308-312.  -This lab examines all three systems: digestive, circulatory, respiratory | -Lab write-up (introduction, purpose, hypothesis, materials, safety, observations, analysis, conclusion)  -K/U, C, T/I, A  • learning skills: *collaboration, initiative, organization, responsibility* |
| 20 | Conclusion/Review for Test | E3, 2.1, 3.1, 3.4 | -Provide students with 20-30 minutes at the beginning of class to finish up any remaining steps from the fetal pig lab  -Play a jeopardy game with students on all three systems: digestive, circulatory, and respiratory. Divide the class up into three groups and have one student represent each group per question.  (A version of a blank jeopardy game is attached) | -Observe student involvement during the Jeopardy game  • learning skills: *collaboration, initiative* |

The following are links to the three videos to be used for lesson 16:

1. <http://www.youtube.com/watch?v=nkRcdfmHqqI>
2. <http://www.youtube.com/watch?v=S5zX15HD8pk&feature=related>
3. <http://www.youtube.com/watch?v=n8LjpGnTWuU&feature=related>

The following is a link to a website that can be used for students completing a fetal pig dissection:

* <http://www.whitman.edu/content/virtualpig>